SPECIFICATION

To All Whom It May Concern:

Be It Known That I, Louis Brown Abrams, a citizen of the United States, residing in the County of Larimer, and State of Colorado, whose post office address is P.O. Box 41, Fort Collins, Colorado 80522-0041, has invented new and useful improvements in

CO-MOLDED FLOCK TRANSFER AND METHOD

D.N.7158/PMD

CROSS-REFERENCE TO RELATED APPLICATIONS

Not Applicable

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not Applicable.

Field of the Invention

This invention relates to molded articles having flocked surfaces, and, in particular, to a new and improved method of applying flocked transfers to molded products.

Background of the Invention

It's often desirable to decorate molded plastic parts for aesthetic or practical purposes. Injection molded articles are often decorated using inks, screen printing, pad printing, direct electrostatic flocking and hot stamping. These methods are most often post-molding operations requiring additional processing and cost and time. In addition, the resulting quality of the product is often low, due to the low quality of adhesion or unevenness of the coating.

Recently In-Mold Decoration has been developed to incorporate the application of decoration while the part is being molded to eliminate the extra step; however, a number of problems have developed with this technology that relate to the inability of the ink or decoration to remain stable during the heat and force of injecting the resins into the mold, that relate to the difficulty of getting the inserted decoration to stay in place, and which may relate to the decoration surface becoming smeared, crushed, or otherwise disturbed during injection molding.

Summary Of The Invention

The present invention uses flock heat transfer type media rather than ink-printed film inserts in order to provide a plush, evenly-coated, three-dimensional textured decoration molded

together with the hot resins when the part is formed. Using flock transfer media, a plushly textured decoration is permanently attached to the surface of the molded part. In order to accomplish this the hot melt adhesive commonly used with flock heat transfer manufacturing is eliminated so it will not liquefy and ooze out around the decoration in the mold. In addition, another adhesive, such as a tie coat material, may be used instead of a normal hot melt to prevent oozing and to promote adhesion and/or chemical compatibility with the molding resin, when injecting molding a flock transfer directly to the polymer molded article.

The mold preferably has a depression or locating pins or other mechanical parts to assist with aligning and holding the decoration in place. Additionally, "dams" built into the mold around the perimeter of the flock heat transfer may be included in order to prevent seepage of the molding resin into the interstitial spaces of the flock transfer, between the fibers.

To further accommodate the incorporation of such a decoration in the injection mold, the molding process may be modified for example by purposely selecting resins of lower melting point or by injecting the resins in two separate stages, a first more "gentle" injection to set the decoration in place, followed up by a full-pressure normal injection of resin.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

Figure 1 is a cross-sectional view a flock transfer being applied to an article in a mold, wherein the transfer lies on top of the article;

Figure 2 is a cross-sectional view similar to FIG. 1, but wherein the flock transfer is imbedded in the article;

Figure 3 is a top plan view of an embodiment of the present invention showing the flock transfer inside an injection mold cavity, wherein the flock transfer is created with a border and

Figure 4 is a top plan view of an embodiment of the present invention showing the flock transfer inside an injection mold, wherein the mold contains a border.

DETAILED DESCRIPTION OF THE INVENTION

In FIG. 1, a transfer 2 of the present invention is shown in place in a mold 4 to be co-molded with a plastic article 6. In FIG. 1, the transfer 2 is shown on top of the article 6. The transfer 2 comprises a dimensionally stable sheet 8 to which a conventional flock transfer release adhesive 10, usually silicone wax, is applied in the reverse of a desired pattern or with overall coverage of the sheet, corresponding to the overall image which is to be flocked and transferred. The flock 12 which may be rayon or any other type of material with a conductive finish such as nylon, polyester or the like is applied to the activated adhesive 10 in any conventional manner, such as, conventional electrostatic means, vibration, air flow or gravity. The method of applying the flock 12 to the adhesive 10 depends on the transfer to be achieved – will the transfer be one color or several colors, will the transfer include any non-flock decorations, etc. Thus, the transfer itself, can be a conventional flock transfers, Lextra or Lextra 3-D type transfer, flocked roll goods such as made by Societe D' Enduction et de Flokage, located in Laval, France, from which pieces may be cut out and even pre-formed to fit better into molds where the surface of the finished product is not flat. The lower ends of the flock 12 are coated with a permanent binder adhesive 14 such as a water based latex which binds the flock into a unit. The binder 14 may contain an additional adhesive, for promoting the adhesion of the transfer to the resin in molding.

A relatively weak pressure-sensitive adhesive 16 can be added to the carrier film 8 in a separate layer, for the purpose of helping to locate the flock transfer 2 in position inside the mold 4 if no mechanical device is available.

FIGS. 1 and 2 illustrate the application of the transfer 2 to a molded article 6 during the molding process. The transfer 2 is positioned in the mold 4 using the pressure-sensitive adhesive 12. Other methods, such as the use of a vacuum, can be used to hold the transfer 2 in place in the mold 4 during the molding operation. Vacuum holes 18 are shown in the mold 4 which pass through the mold body. As seen, the transfer 2 is in contact with the vacuum holes 18. A vacuum can be drawn through the holes 18 to hold the transfer 2 in place. The flock transfer needs to be held securely in the mold in order to maintain the transfer in the desired location on the finished plastic part. If a slight depression (of about 1mm) is built into the mold cavity to accommodate the flock transfer, it will be flush with the molded plastic surface of the finished part. This is seen in FIG. 2. If there is no depression, the flock decoration will stand up on top of the plastic surface, as seen in FIG. 1.

After the transfer is positioned in the mold, the mold is closed and hot resin is injected into the mold. To ensure that the transfer will stay in position during the resin injection, resin with a lower melting point than the release adhesive 16 is used to avoid dislocation of the transfer. On the other hand, if the melt point of any release adhesive utilized, is higher than that of resin, due to the flock providing insulation to the release adhesive, the release adhesive will really not melt in the first place, and is already cross-linked. Hence, criticality of this point may not be that necessary. A particularly preferred method of molding is Reaction Injection Molding (RIM) wherein two base resins are mixed together just as they enter the mold, a chemical reaction occurs at low heat and the plastic material of the end product is formed at that instant.

In an alternative method, lower-pressure injection may be used in a first stage in order to locate and secure the flock transfer in its precise position. Once the transfer is secured in place by the material of the initial injection, a second, full-pressure injection is made to finish the part.

After the resin is injected into the mold, the mold is cooled by circulating water around the exterior of the mold. Although, in some injecting molding processes, utilizing resin, cooling water may already be circulating through the die, during the injection molding process, and thereafter, as known in the art. The mold can be cooled in any other conventional manner. As the resin cools, it solidifies and forms a permanent adhesion to the binder 14. When the part is cooled sufficiently the mold opens up and the part is ejected. Finally, the release sheet 8 and release adhesive 10 are peeled off the fibers 12 to reveal a finished, flocked, surface on the newly molded part.

As an alternative to the invention as described above, it is likely that the flock 12 can be held by other means, to the molded polymer part 6, as follows. While the various release sheets, and release adhesive, may be initially applied to the upper surface of the flock layer, to hold it in position, during molding, rather than utilizing a permanent binder adhesive 14, to hold the flock within or to the molded part, there may be used a thermal setting polyester, such as available from Bostik, Inc,, to permanently adhere the ends of the flock material thereto, and likewise, such a sheet will be cross linked into permanent connection with the molded polymer part 6, to provide a very inherently appearing flock surface, upon the molded part, when finished. Thus, the thermal setting polymer material directly cross links with the molding polymer substance, in the injection molding process, and cures with it, to form a permanently flocked product.

Since the flock of the transfer forms interstitial spaces between fibers, it is desirable to form a barrier between the mold and the perimeter of the transfer to prevent the resin from entering these interstitial spaces during injection of the resin into the mold. Referring to FIG. 3, a barrier 40 may be formed around the transfer 42. Barrier 40 can be formed during the fabrication

of the flock transfer, by providing an excess of binder adhesive 10 around the edge of the transfer. The excess binder adhesive 10 will form a rib or dam around the periphery of the transfer.

Alternatively, referring to FIG. 4, the mold 50 may be provided with a barrier 52, which surrounds transfer 54 when the transfer is placed in the mold. Barrier 52 may be an integral part of mold 50, or may be a separate, added barrier which is composed of silicone, latex or other suitable sealing material.

The in mold flock transfer of the present invention finds particular utility in finished plastic parts where a plush surface is desired.

Numerous variations will occur to those skilled in the art of molding in light of the above description. For example, the in-mold flock transfer decoration of the present invention could be adapted to other molding processes, such as blow molding, vacuum forming, rotational molding and transfer molding. The finished plastic part need not be a flat plane, but by virtue of the flexibility of the flock transfer may be rounded, or portions of the part may be raised. These are merely illustrative.